Using range readiness criteria

RANGELAND HEALTH BROCHURE 5

BRITISH COLUMBIA

Contents

What is range readiness?. 1
Why is range readiness important? 2
Factors in range readiness 3
Indicators of range readiness 4
Recommendations 7
A final word of caution. 8

Citation:

Fraser, D. A. 2003. Using range readiness criteria. Forest Practices Branch, British Columbia Ministry of Forests, Victoria, B.C. Rangeland Health Brochure 5.

URL: http://www.for.gov.bc.ca/hfp/range/range.htm

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Rev. ed. 2004

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Range use plans (RUPs), required for all *Range Act* agreements on Crown range, were changed substantially in 2003. Many plans will now have references to range readiness criteria, average stubble heights, and browse utilization. This brochure discusses the concept of range readiness and the use of criteria to indicate appropriate grazing times. Assessing the leaf development of common grasses is recommended as the most useful indicator of range readiness.

What is range readiness?

The Society for Range Management defines range readiness as "a defined stage of plant growth at which grazing may begin under a specific management plan without permanent damage to vegetation or soils."[1]

The concept of range readiness has been questioned for the past decade as managers have experimented with refined grazing systems.

Some managers maintain that time of grazing is irrelevant. Instead, the severity of grazing (how much leaf is removed) and the time interval before regrazing are deemed important. From a plant physiology perspective, this makes sense, but managers must realize that, for many native grass species, the recovery period is more than 120 growing days, or the entire growing season in many areas.

Also, two elements of range readiness are often overlooked. Firstly, the soil must be dry enough that plants are not uprooted and that compaction is minimized. Secondly, adequate volume and quality of forage must be available to grazing animals. From an animal nutrition and production perspective, early grazing does not make sense.

1 Society for Range Management. 1989. Glossary of range terms.

Why is range readiness important?

Plants and soils

Grazing at improper times damages individual plants, plant communities, soils, and ecosystems.

Severe or frequent grazing will draw down carbohydrate reserves, weaken root systems, reduce vigour, and eventually kill plants. Dead forage plants are usually replaced by weedy plant species.

Soils are the basic resource that determines the capability of a site to support vegetation and grazing animals. If soils are damaged or lost through erosion, the potential of the site will be reduced and less forage will be produced.

The grazing animal

Cattle graze most efficiently when plants are about 15 cm high. An animal on poor-condition range with short and widely spaced plants will take more bites, travel farther, and graze longer to meet nutritional requirements. If average forage height falls below 2 cm, daily intake will be reduced by 80%, and animal production will decline.

Figure 1 Cattle graze most efficiently when grass is about 15 cm high.

Figure 2 Cattle on native range too early in the season. When grass is short, forage intake can drop by as much as 80%. Grazing that is too early, too frequent, or too severe will lead to reduced plant vigour, a shallower root system, less resistance to drought, a change in plant species composition (a decline in the number of perennial grass plants and palatable forbs and an increase in weedy plant species), and an increase in bare ground.

Figure 3 A lush pasture of crested wheatgrass in early spring.

Factors in range readiness

Soils

A cow's hoof exerts 10 times the pressure per unit area than a D-9 Cat with a blade. If the soil is wet, this pressure may compact it, break down structure, reduce permeability, and increase surface crusting and erosion. Damaged soils can take many decades to recover.

Plant phenology — not all plant species are equal

Differences in taste and palatability make some plant species preferred over others. Cattle generally prefer grasses over forbs and shrubs, and prefer green, leafy material over dry, stemmy material. Plants compete with their neighbours for moisture, light, nutrients, and space. A grazed plant has a disadvantage compared to an ungrazed neighbour.

Recovery of plants from grazing varies considerably. Some grasses keep their growing points low to the ground and are able to withstand close grazing (Figure 4), while others elevate their growing points (Figure 5). When the growing point is removed, new lateral buds must develop to produce new leaves (Figure 6); this delays above-ground regrowth and may stop root growth. Lateral bud formation may be delayed until the onset of the fall rains or even until the next growing season.

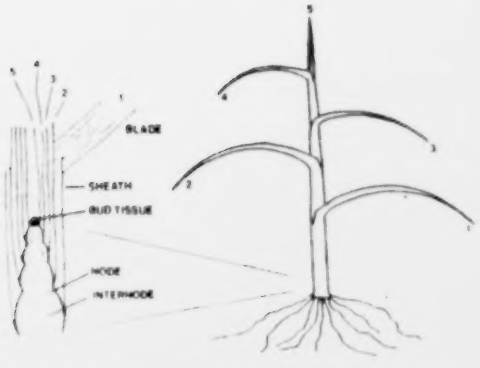

Figure 4 A grass plant in the early stages of growth. Growing points are close to the ground and cannot be removed by grazing.

Differences in season of growth exist among plant species. Some introduced grasses such as cheatgrass (*Bromus tectorum*), Kentucky bluegrass (*Poa pratensis*), and crested wheatgrass (*Agropyron cristatum*) begin their growth at very low temperatures, while others such as muhly (*Muhlenbergia* spp.) and prairie sandreed (*Calamovilfa longifolia*) begin growth later in the season and reach peak growth during the hot summer.

Figure 5 A wheatgrass plant after internode elongation. Growing points are elected and may be removed by grazing.

Figure 6 A grass plant with newly developed lateral buds. After internode elongations, new growth must come from new buds.

Indicators of range readiness

Typically, range readiness has been defined by the flowering of easily identified forbs or shrubs, or the average height of certain grass species. Attempts have been made to use standardized grass heights as readiness criteria. For example, 15 cm of growth has been used to indicate readiness for grazing bluebunch wheatgrass (*Agropyron spicatum*), rough fescue (*Festuca campestris*), and pinegrass (*Calamagrostis rubescens*), and 8 cm for needle-and-thread (*Stipa comata*) and Kentucky bluegrass.

These prescribed phenological stages and heights usually coincide with lowered moisture in the soil profile. The risks of uprooting grass plants and compacting the soil are therefore reduced.

In the Northern Great Plains, range managers have used the flowering of wild rose (*Rosa* spp.), buffalo bean (*Thermopsis rhombifolia*), and three-flowered avens (*Geum triflorum*) as indicators of range readiness. In British Columbia, balsam root (*Balsamorhiza sagittata*) in bloom, wilted Johnny-jump-up (*Fritillaria pudica*) flowers, and flowering Sandberg's bluegrass (*Poa secunda*) have all been used as indicators of readiness.

None of these indicators has proven satisfactory. Flowering stages of these plants are too early for practical use of most grass species, and the grass heights have proven arbitrary and driven more by soil moisture than by phenology. Range managers have thus often chosen fixed calendar dates. Fixed dates are not satisfactory because of large variation in weather from year to year. In British Columbia, readiness may vary as much as 6 weeks from one year to the next.

To be useful, readiness criteria must be easily recognized and consistently applied, and meet the needs of plants and grazing animals. Leaf development of grasses meets these criteria.

Figure 7 A grass tiller at the 3.5 growth stage. The first three leaves have fully developed collars and the fourth leaf is about 50% emerged.

Using leaf development in grasses as an indicator of readiness

J.R. Haun, a researcher working on wheat, devised a simple method of describing leaf development in grasses. Each new leaf is numbered as it appears at the growing point, and its development is described by comparing it to the length and form of a fully grown leaf. A leaf is fully developed when the collar has formed; the next leaf will then begin to emerge. A grass plant with three fully developed leaves per tiller is at the 3.0 growth stage, and one with three fully developed leaves and its fourth leaf at half the length of the previous leaf is at the 3.5 growth stage. Leaves are normally described by increments of 0.1.

The development stage is more difficult to determine in some species, such as bluebunch wheatgrass and pinegrass, because the first two leaves are usually much shorter than leaves 3, 4, and 5, and often break off or senesce early in the season. In these cases it is important to look for the development of the leaf collar and then to interpret how much of the next leaf has emerged, based on leaf form. Also look for evidence that the first and second leaves have dropped off—the leaf collar should still be present.

In crested wheatgrass, it is common for new tillers to develop during the previous fall and for some

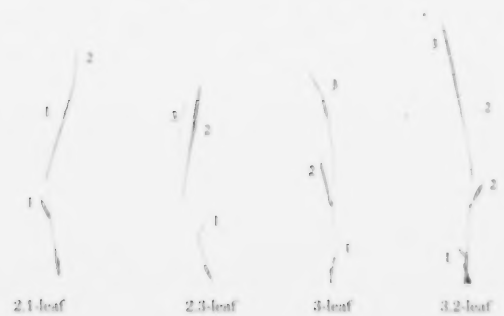

Figure 8 Pinegrass tillers at different stages of leaf development.

leaves to overwinter. These leaves, although brown along the tips, are green farther down and able to begin photosynthesis as soon as the temperature is favourable. These leaves should be included in the leaf count when determining readiness.

Leaf development is directly correlated with growing degree days. Species such as junegrass (*Koleria macrantha*) develop all leaves early in the season, while others such as western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass, and needle-and-thread require many more growing degree days to reach the equivalent stage of development. Leaf stage is relatively easy to determine for most grasses and removes much of the uncertainty about the safe time for grazing.

Several years of observing grasses in the spring and comparing notes with others from across western Canada has resulted in the following conclusions:

- Most introduced forages such as crested wheatgrass, meadow brome (*Bromus riparius*), and orchardgrass (*Dactylis glomerata*) are ready to graze when most (70%) plants have 3.0–3.5 leaves per tiller. The plants can be grazed without damage, and have enough volume to allow for efficient harvesting by cattle.
- More research and observation is needed on native grasses, but, in general, most (70%) indicator grasses (the most important species or the species most susceptible to grazing) should have 4.0 leaves per tiller before grazing begins.
- Northern wheatgrass (*Agropyron dasystachyum*), common in the Peace River area, is somewhat more difficult to assess because its lower leaves dry up or senesce as the season progresses. Based on observations on these rangelands, managers should be waiting for most (70%) grass plants to have 5.5 leaves per tiller before grazing begins.
- Rough fescue is especially vulnerable to early grazing and should not be grazed before the 4.5 leaf stage.

Recommendations for common grasses are found in Table 1.

Table 1 Range readiness as defined by leaf development for some common grass species

Species	Leaf stage
Bluegrasses	2.5
Bluejoint (Canada reedgrass)	3.0
Bromes (introduced)	3.0
Fescue, Altai	4.5
Fescue, Idaho	4.0
Fescue, rough	4.5
Hairgrass, tufted	4.0
Needle-and-thread	3.0
Needlegrass, Columbia	3.0
Needlegrass, stiff	3.0
Orchardgrass	3.0
Pinegrass	2.25–2.5 (at nodding)
Porcupine grass	3.0
Ricegrass, rough-leaved	3.0
Wheatgrass, bluebunch	4.0
Wheatgrass, crested	3.5
Wheatgrass, northern	5.5
Wheatgrass, slender	4.0
Wheatgrass, western	4.0
Wildrye, blue	4.0

Recommendations

- Locate key areas (monitoring sites) that fairly represent the range or pasture unit as a whole.
- Do not select sites that green-up first or last because of their slope, aspect, or soils.
- In these key areas, determine the grass species that will be used to determine readiness. These indicator species should be the most important forage species or the species most susceptible to grazing.
- Walk across the key area and the measure leaf development of about 50 grass plants.
- On most native range, use 4.0 or 4.5 leaves per tiller as the readiness criterion. On tame pastures, use 3.5 leaves per tiller as the readiness criterion.

- The pre-determined leaf stage should be reached on 70% of indicator grass plants before grazing begins.

A final word of caution

Range readiness observations should be part of an ongoing monitoring program. Remember to watch for changes in the plant community, as they may indicate that the range is being grazed improperly. Grazing that is too early, too frequent, or too severe will lead to:

- reduced plant vigour,
- a shallower root system and less resistance to drought,
- a change in plant species composition (a decline in the number of perennial grass plants and palatable forbs and an increase in weedy plant species), and
- an increase in bare ground.

The information gained from monitoring should be used to fine-tune our management and to help us avoid repeating past mistakes. Flexibility and adaptation are the keys to successful range management.

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